2-Sided Tests and Confidence Intervals

In the 2000 NFL season, the home team won in 138 of 240 regular season games. Is this strong evidence that there is a different proportion of wins for home and away teams? Use alpha = 0.05.

$\hat{p} = \frac{138}{240}$

1- What are the hypotheses?

$H_0: p = 0.50$

$H_a: p \neq 0.50$

2- What type of alternative hypothesis do we have (one or two sided)?

two sided ($\neq$)

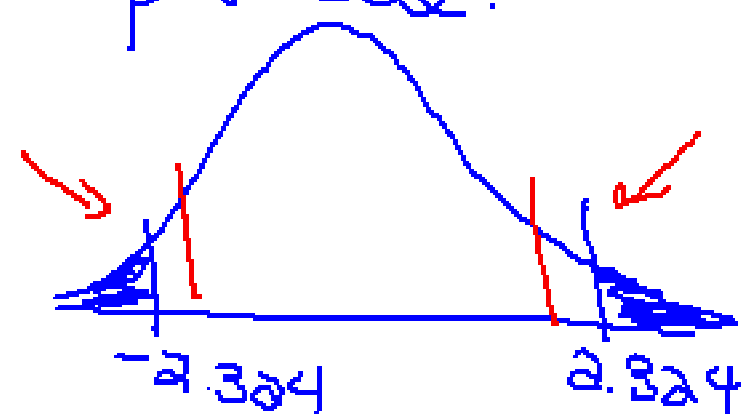
3- What is your significance level?

$\alpha = 0.05$

4- Do the full test of significance. Do you reject or fail to reject the null?

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = 2.324$$

p-value:



$2 \cdot P(z > 2.324) = 0.02$

– reject

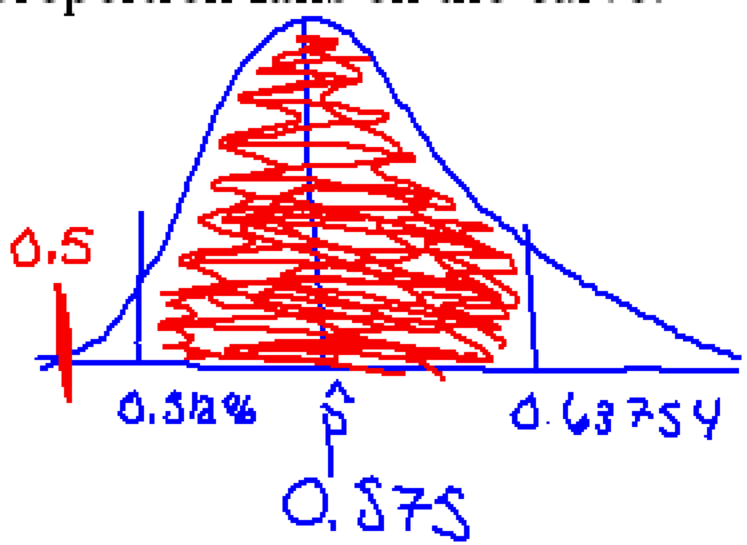
5- What is your sample proportion? $\hat{p} = 0.575$

6- What is your claimed proportion (population proportion)? $p = 0.5$

7- Create a 95% confidence interval for the proportion. (don't interpret, list interval below)

(0.51246, 0.63754)

8- Sketch a normal curve. Put your 95% confidence interval on this curve. Use your sample proportion as the center, since it's the center of your interval. Then mark where your claimed proportion falls on the curve.



9- Does your claimed proportion fall inside or outside of the interval? Did you reject this claim (the null) in your test of significance?

– outside

– reject

2-Sided Tests and Confidence Intervals- Notes

- Confidence Intervals can also be used for…

  2 sided tests

- The confidence level must "match" with…

  α level

  - Examples:

    $\alpha = 0.05 \Rightarrow$ conf level 95%

    $\alpha = 0.03 \Rightarrow$ conf level 97%

Steps for testing a claimed proportion (p) with a confidence interval:

1. Write hypothesis (must be $\neq$)

2. Determine α => Determine conf. level

3. Create conf. interval (a, b)

$\hat{p} \pm$ ___

4. Look @ where p falls (in or out)

in Ho

5. Determine Conclusion:

- Reject if… falls outside interval
- Fail to reject if… falls inside interval

6. Written Conclusion:

- Reject/Fail to Reject at α = ___ because… the claimed proportion falls outside/inside of the ___% conf. int.
- Sufficient evidence… same

Examples:

1. A car service found that the emissions systems of 7 out of the 22 they tested failed to meet pollution control guidelines. Is this strong evidence against the claim that 20% of the fleet is out of compliance? Use a level of significance of 5%.

$\hat{p} = \frac{7}{22}$ $\alpha = 0.05$ Assump

C.L. = 95%

$H_0: p = 0.20$

$H_a: p \neq 0.20$

$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = (0.12355, 0.51281)$

We fail to reject Ho @ α=0.05 b/c our claimed Proportion falls w/in the 95% conf level

We have suff. evid that the prop of cars failing emissions is 20%

Try #2 and 3 on your own! - on board for E.C

For both #2 & 3:

(b) Using your confidence interval, what can be said about the actual value of the population proportion? (other than it's ≠)

- conf int. → shows where true prop. lies.

Same #2

$\hat{p}_Y = \frac{7}{469}$

$\hat{p}_O = \frac{12}{500}$

Use conf. int.

$\alpha = 0.05$

$H_0: p_Y = p_O \quad p_Y - p_O = 0$

$H_a: p_Y \neq p_O$

$$(\hat{p}_Y - \hat{p}_O) \pm z^* \sqrt{\frac{\hat{p}_Y(1-\hat{p}_Y)}{n_Y} + \frac{\hat{p}_O(1-\hat{p}_O)}{n_O}}$$

$= (-0.0264, 0.00826)$

We fail to reject H_0 @ $\alpha = 0.05$ b/c 0 is in the 95% conf int.